



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/723,485

11/26/2003

Seong Hwan Park

30205/39511

9548

4743

7590

02/04/2005

MARSHALL, GERSTEIN & BORUN LLP
6300 SEARS TOWER
233 S. WACKER DRIVE
CHICAGO, IL 60606

EXAMINER

NGUYEN, THANH T

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 02/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/723,485

Applicant(s)

PARK ET AL.

Examiner

Thanh T. Nguyen

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 December 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 11/26/03.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

In view of the argument filed on 12/6/04, the election/restriction requirement has been withdrawn.

Priority

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119 (a)-(d).

Information Disclosure Statement

The information disclosure statement filed 11/26/03 has been considered.

Oath/Declaration

Oath/Declaration filed on 11/26/03 has been considered.

Drawings

The drawings are objected because it is not very clear. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the

Art Unit: 2813

appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Park et al. (U.S. Patent No. 2004/0202969).

1. A method of manufacturing a semiconductor device comprising
a process of forming a photoresist pattern using a photoresist polymer remover
composition, said composition comprising:

Art Unit: 2813

- (a) 5% to 15% of sulfuric acid based on the total weight of said composition (see paragraph# 21),
- (b) 1% to 5% of hydrogen peroxide or 0.0001% to 0.05% of ozone based on the total weight of said composition (see paragraph# 21);
- (c) 0.1% to 5% of acetic acid based on the total weight of said composition (see paragraph# 21);
- (d) 0.0001% to 0.5% of ammonium fluoride based on the total weight of said composition (see paragraph# 21); and
- (e) remaining amount of water (see paragraph# 21).

2. The method according to claim 1, said composition comprising:

- (a) 7% to 10% of sulfuric acid based on the total weight of said composition (see paragraph# 22);
- (b) 2% to 4% of hydrogen peroxide or 0.0002% to 0.001% of ozone based on the total weight of said composition (see paragraph# 23);
- (c) 0.5% to 2% of acetic acid based on the total weight of said composition (see paragraph# 24);
- (d) 0.01% to 0.05% of ammonium fluoride based on the total weight of said composition (see paragraph# 25); and
- (e) remaining amount of water (see paragraph# 21).

3. The method according to claim 1, wherein the composition is further characterized as a dry etching cleaner(see paragraph# 38).

4. The method according to claim 1, wherein the process of forming a photoresist pattern comprises the steps of:

preparing a semiconductor substrate on which an underlying layer is formed (see paragraph# 29);

Art Unit: 2813

forming a photoresist pattern on the underlying layer(see paragraph# 30);

selectively etching the underlying layer using the photoresist pattern as an etching mask(see paragraph# 31); and

cleaning the resulting structure using the photoresist polymer remover composition to remove residual photoresist polymers, whereby forming the underlying layer pattern (see paragraph# 32).

5. The method according to claim 4, wherein the underlying layer is selected from the group consisting of aluminum film, aluminum alloy film, titanium film, titanium nitride film, tungsten film, and combinations thereof (see paragraph# 33).

6. The method according to claim 5, wherein the underlying layer is a stacked film where a titanium nitride film, an aluminum film and a titanium film are sequentially deposited (see paragraph# 33).

7. The method according to claim 4, wherein the underlying layer is an insulating film, and a metal film is formed under the insulating film(see paragraph# 33).

8. The method according to claim 7, wherein the underlying layer is a HSQ (Hydrogen Silsesquioxane) film(see paragraph# 33).

9. The method according to claim 4, further comprising the step of removing the photoresist pattern by an ashing process after the etching and before the cleaning (see paragraph# 35)

10. The method according to claim 4, wherein the photoresist pattern is formed by a photolithography process using ArF (193nm), KrF (248nm), F2 (157nm), EUV (13nm), E-beam, X-ray or ion-beam as an exposure light source (see paragraph# 36).

11. The method according to claim 4, wherein said underlying layer pattern is an insulating film hole pattern or metal line/space pattern(see paragraph# 37).

Art Unit: 2813

12. The method according to claim 4, wherein the photoresist pattern is formed by an etch-back process or CMP (Chemical Mechanical Polishing) process(see paragraph# 38).

13. The method according to claim 4, wherein the cleaning is performed using single-type or batch type equipment(see paragraph# 39).

14. A semiconductor device manufactured by the method of claim 1(see paragraph# 21).

15. A method of cleaning a photoresist pattern using a composition comprising:

- (a) 5% to 15% of sulfuric acid based on the total weight of said composition;
- (b) 1% to 5% of hydrogen peroxide or 0.0001% to 0.05% of ozone based on the total weight of said composition',
- (c) 0.1% to 5% of acetic acid based on the total weight of said composition;
- (d) 0.0001% to 0.5% of ammonium fluoride based on the total weight of said composition; and
- (e) remaining amount of water (see paragraphs# 21-25)

16. A photolithographic method comprising the steps of:

forming a photoresist pattern on a semiconductor substrate; and

cleaning the photoresist pattern using a photoresist polymer remover composition, said composition comprising:

- (a) 5% to 15% of sulfuric acid based on the total weight of said composition,
- (b) 1% to 5% of hydrogen peroxide or 0.0001% to 0.05% of ozone based on the total weight of said composition;
- (c) 0.1% to 5% of acetic acid based on the total weight of said composition;
- (d) 0.0001% to 0.5% of ammonium fluoride based on the total weight of said composition, and
- (e) remaining amount of water (see paragraphs# 21-32).

Art Unit: 2813

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (571) 272-1702. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (See **MPEP 203.08**).

A handwritten signature in black ink, appearing to read 'Thanh', with a long, sweeping horizontal stroke extending to the left.

Thanh Nguyen
Patent Examiner
Patent Examining Group 2800